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REMARKSDISCUSSION OF SPECIFICATION

The specification has been amended to correct minor typographical errors. In particular, the second occurrence of "a" has been deleted in the Brief Description of the Drawings for Figures 3 through 22. No new matter has been added. Acceptance of the amended specification is respectfully requested.

DISCUSSION OF CLAIMS

In the Office Action, claims 74 and 75 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention.

In the Office Action, claims 67-76 are rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent Number 6,070,100 to Bakels et al.

In the Office Action, claims 67, 68, 70, and 73-76 are rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent Number 6,278,894 to Salo et al.

In response thereto, claims 68-75 have been cancelled, claim 67 has been amended, and new claims 77-95 have been added. Accordingly, claims 67 and 76-95 are now pending.

Preliminary Matter

Claims 74 and 75 have been cancelled in response to rejection 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention.

Independent Claim 67

Claim 67 recites a cardiac stimulation device to measure wall dynamics of a patient's heart. The device comprises a first pair of electrodes, a current source, a second pair of electrodes, a voltage measuring circuit, an impedance measuring circuit, and a stimulation circuit. The first pair of electrodes is configured for placement internally in the

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patient and in operable association with the patient's heart. The current source is operably associated with the first pair of electrodes and configured to produce a current therebetween. The second pair of electrodes is configured for placement internally in the patient and in operable association with the patient's heart. Each of the electrodes of the second pair is associated with either the patient's left atrium or the patient's left ventricle. The voltage measuring circuit is operably associated with the second pair of electrodes and is configured to measure a voltage therebetween responsive to the current produced by the current source. An impedance measuring circuit is configured for measuring myocardium impedance as a function of current produced by the current source and the voltage measured by the voltage measuring circuit. For an embodiment having the second pair of electrodes associated with left ventricle, the voltage signal measured by the voltage measuring circuit will predominantly represent myocardium impedance for measuring left ventricular wall dynamics because the second pair of electrodes are positioned so as to be located on the left ventricular free wall (see specification, page 22, lines 7-11). The stimulation circuit is associated with the impedance measuring circuit and is configured to stimulate the patient's heart as a function of the measured myocardium impedance.

The Bakels et al. reference discloses a multiple chamber pacing system to treat various forms of heart failure. The system utilizes impedance sensing to determining optimum pacing parameters, arrhythmias, or progression of heart failure. Impedance sensing is provided between selected pairs of the four chambers.

The Bakels et al. reference does not disclose or suggest measuring myocardium impedance between a pair of electrodes wherein each of the electrodes of the second pair are associated with either the patient's left atrium or the patient's left ventricle. As such, claim 67 recites impedance measurements performed within a single chamber to measure wall dynamics of the patient's heart. In the Bakels et al. reference, impedance is determined between selected pair of the four chambers (e.g., inter-ventricular or atrio-ventricular impedance measurements).

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The Salo et al. reference discloses an apparatus for performing impedance plethysmograph. By appropriate selection of electrodes on a first and second leads to drive an AC carrier signal and other electrodes coupled to a sensing amplifier, an impedance versus time signal is derived. The signal is processed to provide useful information concerning cardiac performance in patients having CHF.

The Salo et al. reference does not disclose or suggest measuring myocardium impedance between a pair of electrodes. In accordance with column 4, lines 34-39, "... the application of AC carrier signal across a pair of electrodes creates an electric field and since blood is a fairly good conductor, the inflow and outflow of blood from the heart results in a change of impedance and, therefore, the voltage being picked up by the selected pair of sensing electrodes." As such, it appears that the impedance plethysmography apparatus of the Salo et al. reference is directed to measuring impedance related to blood volume whereas claim 67 of the present application is directed to measuring myocardium impedance to determine wall dynamics.

Accordingly, it is respectfully submitted that claim 67 is in condition for allowance.

Dependent Claims 76

Claim 76 depends from claim 67 and is similarly patentable. Accordingly, it is respectfully submitted that claim 76 is in condition for allowance.

Independent Claim 78

For at least the same reasons discussed above with regards to claim 67, it is respectfully submitted that claim 78 is in condition for allowance.

Dependent Claim 79-84

Claims 79-84 depend from claim 78 and are similarly patentable. Accordingly, it is respectfully submitted that these claims are condition for allowance.

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Independent Claim 85

For at least the same reasons discussed above with regards to claim 67, it is respectfully submitted that claim 85 is in condition for allowance.

Dependent Claim 86-91

Claims 86-91 depend from claim 85 and are similarly patentable. Accordingly, it is respectfully submitted that these claims are condition for allowance.

Independent Claim 92

Claim 92 recites a cardiac stimulation device to measure left ventricular wall dynamics of a patient's heart. The device comprises a first electrode, a second electrode, a current source, a voltage measuring circuit, an impedance measuring circuit, and a stimulation circuit. The first electrode and the second electrode are configured for placement internally in the patient and in operable association with the patient's left ventricle. The current source is coupled to the first electrode and second electrode to produce a current therebetween. A voltage measuring circuit is coupled to the first electrode and the second electrode to measure a voltage therebetween responsive to the current produced by the current source. The impedance measuring circuit is configured to measure myocardium impedance as a function of the current produced by the current source and the voltage measured by the voltage measuring circuit. The stimulation circuit is associated with the impedance measuring circuit and configured to stimulate the patient's heart as a function of the measured myocardium impedance.

The Bakels et al. reference does not disclose or suggest producing a current between a first and second electrode and measuring a voltage therebetween responsive to the current produced by the current source. In the Bakels et al. reference, the electrodes (53, 54) utilized to generate current differ from the electrodes (57, 58) utilized to measure voltage (see Figure 2B).

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Similarly, the Salo et al. reference does not disclose or suggest producing a current between a first and second electrode and measuring a voltage therebetween responsive to the current produced by the current source. Figures 2(a), 2(b), 2(c), 2(d), and 2(e) illustrate various embodiments in which the electrodes utilized to generate a current differ from the electrodes utilized to measure impedance.

Accordingly, it is respectfully submitted that claim 92 is in condition for allowance.

Dependent Claims 93-95

Claim 93-95 depend from claim 92 and are similarly patentable. Accordingly, it is respectfully submitted that these claims are in condition for allowance.

CONCLUSION

In light of the above claim amendments and remarks, it is respectfully submitted that the application is in condition for allowance, and an early notice of allowance is requested.

Respectfully submitted,

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Date



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